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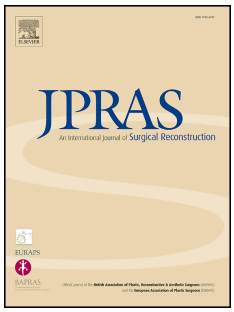

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ELBOW DEFECT COVERAGE USING A CAPILLARY PERFORATOR FLAP ARISING FROM THE VASA NERVOSUM OF THE ULNAR NERVE

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Freestyle flap; perforator flap; neurocutaneous; elbow; soft tissue; reconstruction.

Dear Sir,

Traditionally the pedicled latissimus dorsi muscle flap has been the workhorse flap for large elbow defects. Other options include the pedicled radial forearm flap and the reverse lateral arm flap, which can also be raised as a perforator-based radial collateral artery perforator (RCAP) flap. More recently, freestyle perforator flaps have broadened the options for soft tissue reconstruction[1]. We describe a case of a free-style perforator flap for elbow reconstruction based on the capillary perforators arising from the vasa nervorum of the ulnar nerve.

An 89-year-old female patient underwent a wide excision of a biopsy proven nodular malignant melanoma, of 6.4mm Breslow thickness, on the radial aspect of the left elbow area (Figure 1). Pre- operatively an RCAP over the mid-arm was identified using a hand-held Doppler device. The melanoma was then excised with a 3cms lateral margin up to the deep fascia. The excision resulted in a 15 x 10 cms defect around the elbow in full extension. The flap based on the RCAP was marked on the posterolateral portion of distal upper arm, to be raised as a free-style propeller flap.

During dissection however, a cluster of small perforators, 5 cms proximal to the elbow joint arising from the ulnar nerve vasa nervosum, was identified and preserved (Figure 2). One of the RCAPs, which was in the proximal third of the flap, was also identified and preserved, but it was not possible to transpose or pivot the flap based on the RCAP. Given this, the RCAP was clamped for ten minutes to determine the perfusion of the flap from the capillary perforators of

the ulnar nerve vasa nervorum, which was optimal. Next, the RCAP was divided and the flap rotated through 180 degrees before being inset to cover the defect. The donor site was closed primarily and a bulky elbow dressing was applied. Elbow movement was allowed from day one with no restriction. The flap survived completely and all the wounds healed uneventfully with good functional and aesthetic outcomes with six weeks' post-op pictures shown in figure 3.

The concept of neurocutaneous flaps is not a new one. Masquelet et al and Nakajima et al pioneered neurocutaneous flaps in the 1990s by demonstrating that vessels accompanying the superficial nerves enable skin flaps to survive[2,3]. Bertelli and Khoury studied the vascularization of the radial and ulnar nerves on the dorsal aspect of the hand and were able to plan and raise cutaneous island flaps vascularized by the vessels around and inside the nerves[4]. These flaps survived on the dictum that their respective nerves and accompanying vasa nervorum were needed to be fully incorporated in these flaps. The question asked here is whether it is necessary to include the entire nerve complex in these flaps but base them instead upon vasa nervorum capillary perforators.

Koshima described the concept of capillary perforator flaps in the thoracodorsal vascular system[5] as a viable option in 2010. This alongside the previously described superficial peroneal nerve accessory artery perforator (SPNAA) perforator flap; a flap supplied by vasa nervorum without sacrificing the donor artery and the nerve[6] supports our finding of the capillary perforators around the ulnar nerve and its use as a free-styled perforator flap. There has also been another case of a perforator flap being raised on the vasa nervorum of the anterior femoral

cutaneous nerve[7]. This emphasises the fact that perforators do arise from the vasa nervorum in the vicinity of nerves and this can be used to our advantage when raising perforator flaps.

Using this concept, we were able to reconstruct a large defect around the elbow with a free-style perforator flap based on the capillary perforators arising from the vasa nervorum of the ulnar nerve, with preservation of the nerve itself. It is important to note here that the perforators described in this case were not individually distinct, but existed in the form of a 'vascular leash', akin to the pedicle of the Foucher flap. This cluster of perforators was able to sustain the flap because their distal vector was in the axis of the flap.

In the future, we expect more such flaps being described as surgeons' become increasingly aware of the presence of capillary perforators, even around indispensable nerves or structures. It also calls on those of us performing free-style perforator flaps to keep an open mind about source vessel(s) and to expect the unexpected.

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FIGURE LEGENDS

Figure 1 Pre-operative appearance of a 3 x 3cms nodular melanoma on the radial aspect of the left elbow.

Figure 2 Intra-operative view of the cluster of capillary perforators, 5 cms proximal to the elbow joint, arising from the ulnar nerve vasa nervosum. As can be seen, there is no accompanying superior ulnar collateral artery with the ulnar nerve and there are multiple capillary perforators arising from the vasa nervosum of the ulnar nerve. The forceps here points to the ulnar nerve

Figure 3 Post-operative photograph of the perforator flap used for soft tissue reconstruction of the elbow, six weeks after surgery.